Covers - Thebes & Jonesboro quadrangles

State of Illinois, Department
of Registration and Education
STATE GEOLOGICAL SURVEY, URBANA

JOHN C. FRYE, Chief

EARTH SCIENCE FIELD TRIP

GUIDE LEAFLET

THEBES AREA

ALEXANDER COUNTY

THEBES AND JONESBORO QUADRANGLES

Leader

GEORGE M. WILSON

ILLINOIS STATE GEOLOGICAL SURVEY, URBANA

October 20, 1956

GUIDE LEAFLET NO. 56F HOST: THEBES HIGH SCHOOL

THEBES FIELD TRIP

October 20, 1956

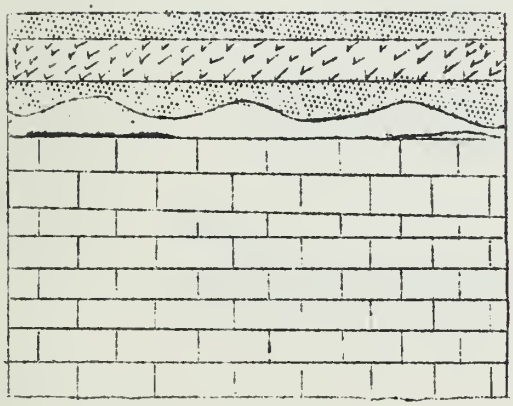
Distance	Mileage	
0.0	0.0	Thebes High School. Align the cars headed south.

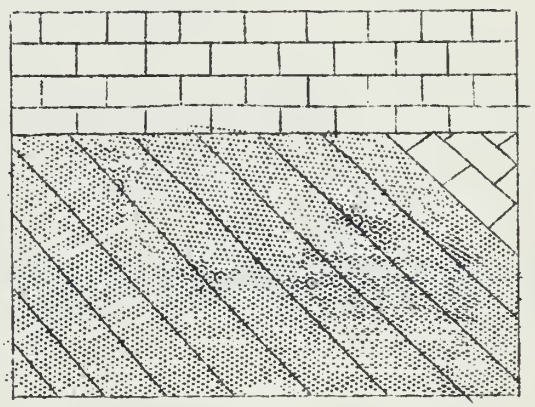
The Thebes area is especially interesting to the geologist because of the extremely interesting series of events that one may unfold. No Pleistocene glacier reached as far south as Thebes, although it did reach the north line of Union County, some forty miles away. There are, however, Pleistocene deposits in this region. We recognize deposits of sand, gravel, and loess, all thought to be of Wisconsin age. Deposits of pre-Illinoian loess are a short distance away. The loess is relatively fine grained silt that has been picked up from the valley flats and deposited on the hills.

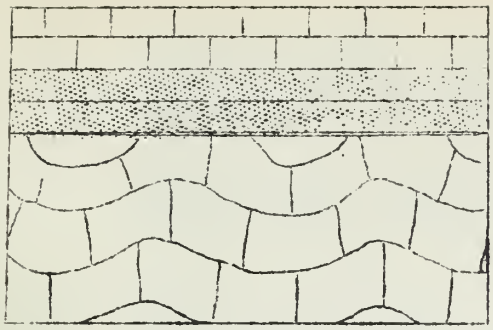
Study of the map of the Thebes region is especially interesting, for there are vast valleys in which small streams flow and a small valley in which the Mississippi flows. It is thought that the small valley or gorge cut south of Gale and extending to Fayville was formed during the time of the Kankakee Torrent, or the Cary substage. During this time the flow of water greatly increased and the flood waters breached the low ridge between Gale and Fayville. The quantity of water, velocity and the tools in sand and gravel cut the new channel, thus the channel, which had earlier developed north and west of Gale, was abandoned.

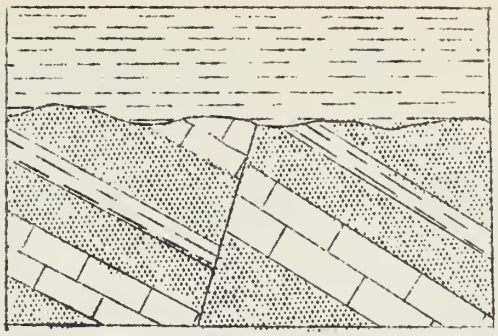
Finally the flood waters subsided, and great flats resulted in the former river valley. The winds blowing across the valley picked up the fine silt and encountering the high river bluff, dropped its load - thicker close to the rivers. This loess is to be found in all of southern Illinois. In this area it is as much as 35 feet thick.

For the geologist another reason for interest in these rocks is that there are numerous unconformities. An unconformity exists when there is a break in the continuity of rock. An unconformity is a surface of erosion or nondeposition separating younger strata from older. (See illustrations.) There were numerous times that the marine seas covered this region, the lands rose and were subjected to erosion, to be submerged later in the seas, thus there are breaks in the geologic column.









The greatest break in the continuity of sediments or unconformity is between the upper Ordovician and the Cretaceous. In this area we have no information and no rock to represent 200 million years.

In the Illinois coal fields to the north during Mississippian and Pennsylvanian time alone there were at least 3000 feet of sediments preserved. We have reason to believe that these rocks also covered this area but the process of erosion has carried them away.

0.2 0.2 Turn right. Shift into Second. Hill.

0.1 0.3 Stop. Turn left (west).

0.1 0.4 Slow. Turn left.

0.2 0.6 STOP 1. Thebes Sandstone

This sandstone is thought to be a lenticular body in the Upper Ordovician and corresponds to the Maquoketa shale in the northern portion of the State. The Thebes sandstone varies in thickness, but reaches as much as 100 feet. This fine grained sandstone diminishes in thickness and disappears completely, wedging into shale in a relatively short distance. Occasionally marine fossils are found in this sand.

The Ordovician section in the Thebes area is as follows:

	Thickness Feet
Thebes sandstone	75-100
Fernvale limestone	3
Kimmswick limestone	80 plus

Details on the Thebes sandstone are as follows:

Sandstone, silty, shaly, well but thinly laminated .	10
Shale, medium gray, silty, with sandstone stringers .	6
Sandstone, light gray, fine	15

0.8 1.4 STOP 2.

The Kimmswick limestone is the oldest formation outcropping in southern Illinois, and corresponds with the Galena of the lead-zinc district of

northern Illinois. In this area it is exposed on the crest of the Thebes anticline. An anticline is an arch of rock in which the beds or layers dip in opposite directions at the crest.

The Kimmswick limestone is coarsely crystalline, and of organic origin. Fossils such as the "sunflower corals" or Receptaculites, trilobites, bryozoa, corals, and brachiopods are common in this formation.

Rock of this texture, which can be easily polished, is a potential source for a commercial marble operation. The subsurface equivalent of the Kimmswick has produced oil in several oil pools in Illinois and represents the deepest producing zone in Illinois.

0.7 2.1 Slow. Rough bridge.
Orchard Creek shale outcrops in the stream at the mouth of Rock Springs Hollow.

0.1 2.2 Slow, turn left into Rock Springs Hollow.

0.1 2.3 STOP 3. Silurian limestone - Girardeau formation.

This limestone is near the base of the Silurian system of rocks. The limestone is characterized by discontinuous layers of thin-bedded limestone with shale partings. It is blue-gray, fine, brittle and sparsely fossiliferous, although occasionally many fossils are found locally in shale partings. This formation has been called Ordovician and Silurian, but on the fossil evidence and the angular unconformity between the Girardeau and Sexton Creek, it is referred to the Silurian system. The Girardeau here is at least 30 feet thick.

Above the railroad bridge and only a short distance away, is a much younger series of rocks which are of considerable interest.

The sequence is as follows:

	Thickness Feet
Pleistocene Series	
Loess, humic loess soil	2
Loess, light tan to gray	4
Loess, brown with tan chert pebbles in the lower portion and with loess concretions or "loess kindchen"	5
Tertiary System	
Pliocene Series	
Lafayette formation	
Limonitic conglomerate	1-3
Clay, red, sandy	2
Shale, gray and tan, micaceous, moderately well bedded	2
Sand, partially cemented, red, limonitic	3
Siltstone, fine, light gray, with irregular lenses of chert pebble conglomerate	4-12
Cretaceous System	
Clay, light gray, almost white, micaceous	15

Over much of southern Illinois there are Tertiary gravel deposits as well as Cretaceous clay deposits. Many of the pebbles in the gravel have an outer layer of iron oxide or limonite. An occasional excellent agate specimen may be found. An unconformity of considerable magnitude between the Cretaceous and the underlying Silurian is evident. All of the Devonian, Mississippian, and Pennsylvanian are missing here. There are no known sediments of Permian, Traissic, or Jurassic age in Illinois. Easily 4000 feet of rock are missing in this interval.

0.6 2.9 STOP 4.

In the bed of the stream are many chert and agate pebbles, with an occasional Cretaceous fossilized wood fragment. The chert and agate is derived from the erosion of the Lafayette gravels.

Also in the bed of the stream you will note the olive green to light gray limestone, with an occasional red mass. This is the lowermost Bainbridge limestone of Silurian age.

0.9 3.7 STOP 5. Bainbridge limestone.

The Bainbridge of southern Illinois is a mottled light gray and red stone, which is easily recognized. In this outcrop it is especially red, shaley, and impure, while in the immediate area it is a relatively pure limestone. Fossils are common, especially cephalopods.

The relationship between the Silurian Bainbridge and the overlying Devonian Bailey is not readily found in this area.

0.5 4.2 Note the terraces on the right about 15 feet above the road at approximately 460 feet elevation.

0.4 4.6 Slow, turn left (north).
Note terraces on the right and left.

0.3 4.9 Stop. Danger. Enter Route 3 with caution. Turn right.
Note the erosion in the loess covered hills.

0.2 5.1 Note the red Bainbridge limestone in the stream on the right.

0.1 5.2 Note the erosion in loess.

1.6 6.8 Note the erosion in the loess covered hills on the left.

1.8 8.6 STOP 6. LUNCH. The Olive Branch School.
Discussion of the geology thus far seen today and a pre-view of the afternoon.

0.2 8.8 STOP 6A.

The Devonian limestone (Bailey formation) is cherty, siliceous, but relatively unaltered. The limestone is medium gray, dense and sparsely fossiliferous. More or less continuous bands or beds of chert are common in this formation.

0.1 8.9 Slow, turn left (northeast).

0.8 9.7 STOP 7. Bailey formation.

Here the siliceous, cherty Bailey limestone has been altered to chert and tripoli. Perhaps there has been replacement of the limestone, but it is evident that there has been a reduction in the thickness of the formation. The white powdery material is called tripoli. This material, which is a micro-crystalline quartz was derived from extensive weathering of siliceous limestone. The mechanics of this procedure is not understood.

The section here is as follows:

	Thickness Feet
Chert, stained red, nodular.	15-20
Chert and tripoli, chert nodules are surrounded by the finely divided tripoli	70

3.8 13.5 Slow at Y at Sandy Creek Church, turn right.

0.7 14.2 Cut in Grassy Knob chert. In this cut variations in the degree of leaching are evident, for in some places the bedding is preserved, while in others the bedding planes are distorted or lost.

0.7 14.9 Slow, turn left.

1.1 16.0 Note abandoned silica pit on the left, turn right.

0.9 16.9 Slow, caution, turn left (north).

0.6 17.5 View of large silica and chert pit dead ahead.

1.6 19.1 Slow, turn right.

0.4 19.5 STOP 8.

The section here is as follows:

	Thickness Feet
Pleistocene Series	
Wisconsin stage	
Loess, buff	10
Devonian System	
Dutch Creek sandstone, in part altered to quartzite, medium to coarse, fossiliferous	0-10 plus
Clear Creek chert, fossiliferous	30-50

The percolating waters through time have removed the calcareous cement from the sandstone and removed the lime from the Clear Creek formation so that only the casts and molds remain. A rather wide variety of fossils such as brachiopods, trilobites, corals, gastropods, and pelecypods are to be found.

0.3 19.8 Stop, turn left on Route 127.

1.8 21.6 Note the Silica mill on the left, where ganister and tripoli are prepared for the market. Ganister is a term applied to a southern Illinois high silica material, which is loosely consolidated and readily disintegrates into irregular particles of an inch or less in size.

0.5 22.1 STOP 9. Mississippian System - Osage Group.

Hartline formation, when unaltered is largely an impure cherty limestone, is here a chert and ganister. The formation unconformably overlies the Springville shale. The relations of the overlying Lower Mississippian group of formations including the Burlington, Keokuk, Warsaw, and Salem are not clear. It is thought that the Hartline becomes less cherty to the north. The red earth or red cherty residum is characteristic of the Hartline in this area. The conditions that caused the alteration of the limestones and shales to alter to cherts and tripoli in selective regions is not known. The same processes selectively altered sandstones to quartzites. Only a few miles north on Mill Creek, limestone sufficiently free of impurities is quarried for building stone purposes.

0.2 22.2 STOP 10.

The section here is as follows:

	Thickness Feet
Pleistocene Series	
Wisconsin stage	
Loess, buff to tan	10
Silt, with chert pebbles	4
Cobbles and gravel with sand and silt	4
Tertiary System	
Pliocene Series	
Lafayette formation	
Coarse gravel with gravelly clay filling, pebbles polished, some coated with limonite	5
Pre-Lafayette (?)	
Gravel, coarse, cherty, pebbles unpolished	10

The deposit here is a terrace remnant at 460 feet elevation. The present valley level is 375 feet. The pebbles in this deposit are largely chert, and some of them have a rather high polish, others a limonite coating. The lower portion of the outcrop may represent an age slightly older than Lafayette.

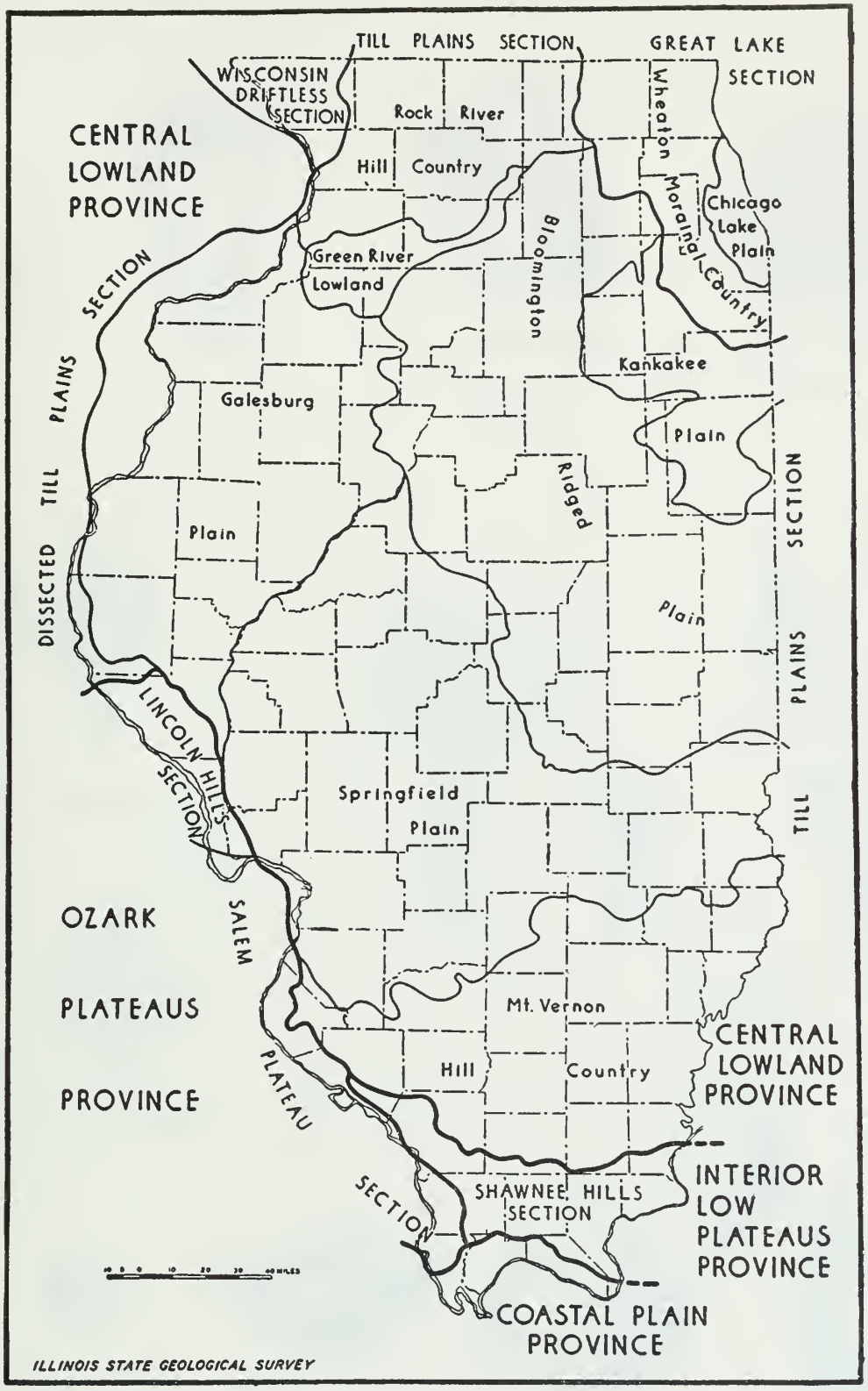
SEE YOU NEXT SPRING

Time Table of Pleistocene Glaciation
(after M. M. Leighton and H. B. Willman, 1950)

Stages	Sub-stages	Nature of Deposits	Special Features
Recent		Soil, infant to youthful profile of weathering, lake and river deposits, dunes, peat.	
Wisconsin (4th glacial)	Late Mankato	Fluvial deposition - Mississippi, Illinois, and Ohio river valleys; dune sand, some loess deposits along Mississippi River Valley; and deposits in Lake Chicago.	Lake Agassiz Torrent eroded Late Mankato deposits
	Early Mankato		Lake Duluth Torrent eroded Early Mankato deposits
			Forest bed, Two Creeks, Wisconsin
	Cary	Drift, loess, dunes, beginning of deposits in Lake Chicago	Kankakee and Lake Maumee Torrents
	Tazewell	Drift, loess, dunes, lake deposits.	Fox River Torrent Westward diversion of Mississippi River into Iowa by Tazewell ice lobe
	Iowan	Drift, loess, dunes	
	Farmdale (Pro-Wis.)	Loess (in advance of glaciation)	
Sangamon (3rd interglacial)		Soil, mature profile of weathering, alluvium, peat	
Illinoian (3rd glacial)	Buffalo Hart	Drift	
	Jacksonville	Drift	
	Payson (terminal)	Drift	
	Loveland (Pro-Ill.)	Loess (in advance of glaciation)	
Yarmouth (2nd interglacial)		Soil, mature profile of weathering, alluvium, peat.	
Kansan (2nd glacial)		Drift Loess	
Aftonian (1st interglacial)		Soil, mature profile of weathering, alluvium, peat.	
Nebraskan (1st glacial)		Drift	

GENERALIZED GEOLOGIC COLUMN
FOR THE CAIRO AREA
Prepared by the Illinois State Geological Survey

ERAS		PERIODS	EPOCHS	FORMATIONS
Cenozoic	Age of Mammals	Quaternary	Pleistocene	Loess and alluvium of several glacial stages
		Tertiary	Pliocene	Lafayette gravels
			Miocene	Not present in Illinois
			Oligocene	Not present in Illinois
			Eocene	Wilcox sand and clay
			Paleocene	Porters Creek clay and Clayton greensand
Mesozoic	Age of Reptiles	Cretaceous		McNairy sands and clays
		Jurassic		Not present in Illinois
		Triassic		Not present in Illinois
Paleozoic	Age of Amphibians and Early Plants	Permian		Not present in Illinois
		Pennsylvanian		Not present in Thebes area
		Mississippian	Chester Iowa Meramec group Osage group Kinderhook group	Not present in Thebes area Warsaw-Salem limestone Burlington-Keokuk limestone Hartline chert (chert & ganister) Springville shale
	Age of Fishes	Devonian	Upper Devonian Middle Devonian Erian group Ulsterian group Lower Devonian Oriskanian group Helderbergian group	Not present in Thebes area Dutch Creek sandstone Clear Creek chert (thick residual chert) Bailey limestone and chert (residual chert & tripoli)
	Age of Invertebrates	Silurian	Niagaran Alexandrian	Bainbridge limestone Sexton Creek limestone & shale Edgewood limestone (not seen) Girardeau limestone Orchard Creek shale (and impure limestone)
		Ordovician	Cincinnatian Mohawkian	Thebes sandstone & shale Fernvale limestone Kimmswick limestone (thick pure limestone)
		Cambrian		Deeply buried in Thebes area
Proterozoic Archeozoic		Referred to as "Pre-Cambrian" Time		Deeply buried in Thebes area



PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Report of Investigations No. 129, Physiographic Divisions of Illinois, by M. M. Leighton, George E. Ekblaw, and Leland Horberg)

COMMON TYPES of ILLINOIS FOSSILS

GRAPTOLITE

Cup coral

Lithostrotion

CORALS

Honeycomb coral

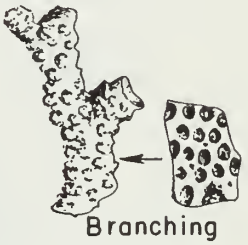
CRINOID

CYSTOID

PENTREMITE

Fenestella

Archimedes

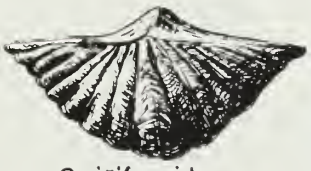


Branching

BRYOZOA

Lingula

Orbiculoidea



Spiriferoid

Productoid

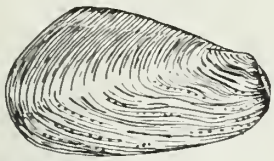
Composita

Pentameroid

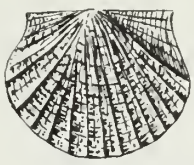
BRACHIOPODS

M.M.C.

COMMON TYPES of ILLINOIS FOSSILS



"Clam"



"Scallop"

PELECYPODS

High- spired

Low - spired

Flat - spired

GASTROPODS

Curved cone

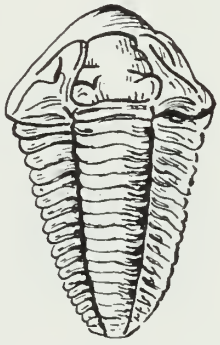
Straight cone

Coiled cone
(Nautilus)

CEPHALOPODS

Bumastus

Calymene
(coiled)

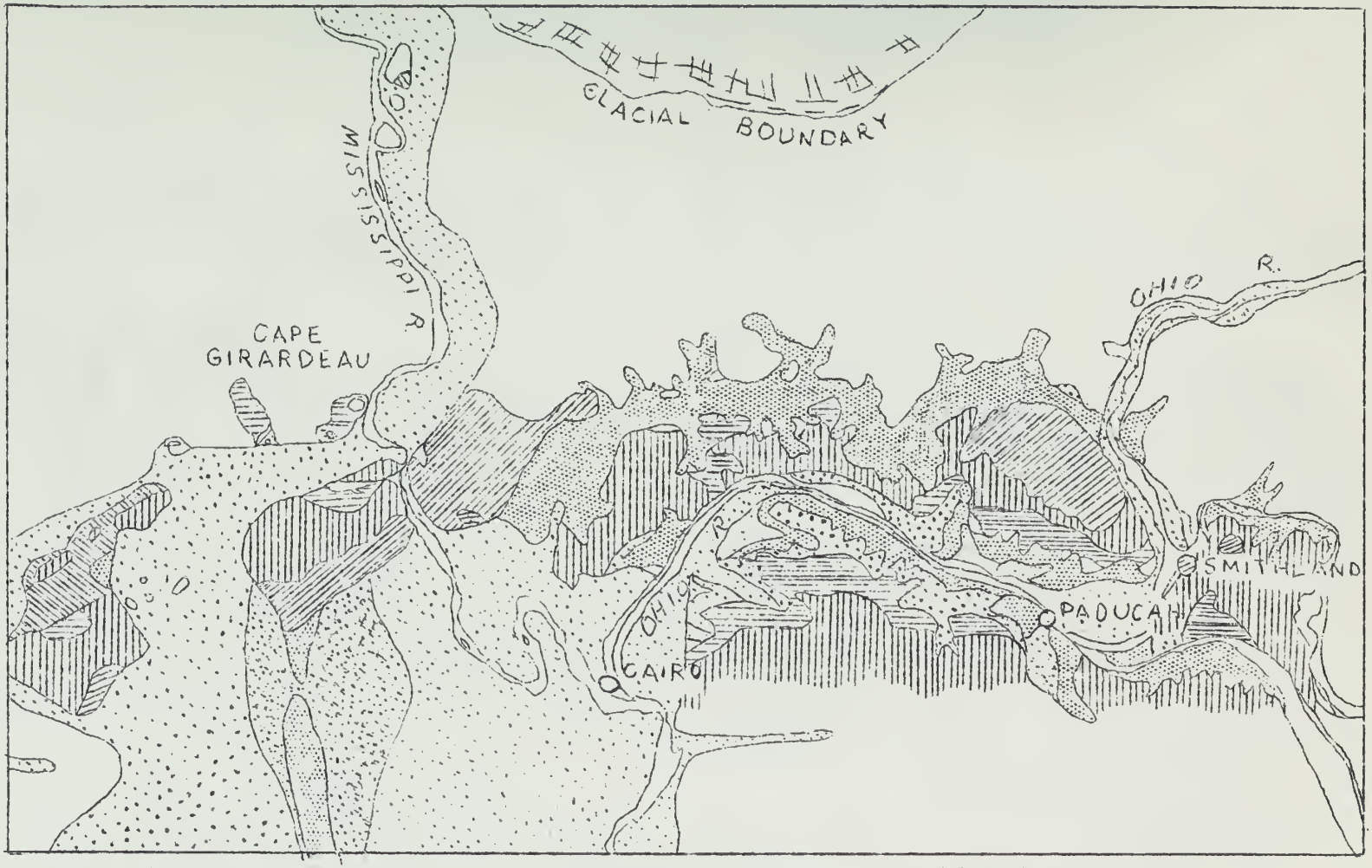


Calymene
(flat)

TRILOBITES

OSTRACODS
(greatly enlarged)

M.M.C.



LATE CENOZOIC SURFACES AND SEDIMENTS AT HEAD OF COASTAL PLAIN

Covers - Thebes & Jonesboro quadrangles